What is claimed is:

1. A method for recording/reproducing magnetization information, comprising the steps of:

positioning a metal probe so as to face a multilayer film that includes a first ferromagnetic metal layer, a non-magnetic metal layer formed on said first ferromagnetic metal layer, and a second ferromagnetic metal layer formed on said non-magnetic metal layer;

applying a voltage between said multilayer film and said metal probe to magnetize an area of said multilayer film that faces said metal probe according to said applied voltage, thereby writing magnetization information in said magnetized area;

injecting a light beam between said metal probe and said multilayer film to induce plasmon there while detecting a tunnel current that flows between said metal probe and said multilayer film; and

reading magnetization information written in said multilayer film according to said detected tunnel current.

2. The method according to claim 1:

wherein the wavelength of said light beam injected between said metal probe and said multilayer film is a wavelength that causes plasmon resonance when the magnetizing directions of said first and second ferromagnetic metal layers are parallel to each other or a wavelength that causes plasmon resonance when the magnetizing directions of said first and second ferromagnetic metal layers are antiparallel to each other.

3. The method according to claim 2:

wherein said light beam injected between said metal probe and said multilayer film is polarized and modulated by a fixed frequency to detect the modulation frequency component of said tunnel current in said step of detecting said tunnel current.

4. The method according to claim 1:

wherein the wavelength of said light beam injected between said metal probe and said multilayer film is modulated by a fixed frequency between said wavelength that causes plasmon resonance when the magnetizing directions of said first and second ferromagnetic metal layers are parallel to each other and said wavelength that causes plasmon resonance when the magnetizing directions of said first and second ferromagnetic metal layers are antiparallel to

each other so as to make phase sensitive detection of said tunnel current with use of said modulation frequency in said step of detecting said tunnel current.

5. The method according to any of claims 1 to 4:

wherein the magnetizing direction of said first and second ferromagnetic metal layers are changed locally so as to become parallel to each other or not become parallel to each other according to said applied voltage in said step of writing said magnetization information.

6. An apparatus for recording/reproducing magnetization information, comprising:

a recording medium that includes a multilayer film consisting of a first ferromagnetic metal layer, a non-magnetic metal layer formed on said first ferromagnetic metal layer, and a second ferromagnetic metal layer formed on said non-magnetic metal layer;

a metal probe disposed so as to face said recording medium;

voltage applying means for applying a voltage between said metal probe and said recording medium; and

light injecting means for injecting a light beam between said metal probe and said recording medium.

7. The apparatus according to claim 6:

wherein said apparatus further includes injects a light beam having a wavelength that causes plasmon resonance in an object when the magnetizing directions of said first and second ferromagnetic metal layers are parallel or a wavelength that causes plasmon resonance when the magnetizing directions of said first and second ferromagnetic metal layers are antiparallel to each other; and

wherein said light injecting means includes means for detecting the tunnel current flowing between said metal probe and said recording medium.

8. The apparatus according to claim 7:

wherein said light injecting means modulates the polarized state of said injection light beam with a fixed frequency; and

wherein said light injecting means includes means for detecting said modulation frequency component of said detected tunnel current.

9. The apparatus according to claim 6:

wherein said light injecting means modulates the wavelength of an injection light with a fixed frequency between said wavelength that causes plasmon resonance when the magnetizing directions of said first and second ferromagnetic metal layers are parallel to each other and said wavelength that causes plasmon resonance when the magnetizing directions of said first and second ferromagnetic metal layers are antiparallel to each other; and

wherein said light injecting means includes:

means for detecting a tunnel current flowing between said metal probe and said recording medium; and

means for making phase sensitive detection of said detected tunnel current with use of said modulation frequency.

10. The apparatus according to any of claims 6 to 9:

wherein said apparatus further includes means for driving said recording medium rotationally and a slider provided at the tip of an arm having one end supported rotationally and the other end extended to said recording medium formed like a disk; and

wherein said metal probe is disposed on the bottom face of said slider.

11. The apparatus according to claim 10:

wherein said slider includes means for guiding and injecting a semiconductor laser beam around said tip of said metal probe.

12. The apparatus according to claim 11:

wherein said metal probe is formed of a metal film structured to have a sharp-pointed tip pattern.

13. The apparatus according to any of claims 6 to 12:

wherein said second ferromagnetic metal layer is divided into a plurality of spaces, each corresponding to a unit of information to be recorded.

14. The apparatus according to any of claims 6 to 13:

wherein said recording medium includes an anti-ferromagnetic layer formed beneath said first ferromagnetic metal layer.

15. The apparatus according to any of claims 6 to 14:

wherein a plurality of said metal probes are disposed at predetermined pitches and each of said plurality of metal probes records/reproduces magnetization information.